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| EXAMINER | |
|---|---|
| CURS, NATHAN M | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2633 | |

DATE MAILED: 08/09/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/059,580 | GAZDZINSKI, ROBERT F. | |
| | Examiner | Art Unit | |
| | Nathan Curs | 2633 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *12 May 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1,3-5,7-18 and 20-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) *28 and 29* is/are allowed.

6)☒ Claim(s) *1,3-5,7,8,10-18,20-27 and 30* is/are rejected.

7)☐ Claim(s) *9* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 May 2005* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Allowable Subject Matter*

1. The indicated allowability of claims 8 and 10 is withdrawn. Rejections based on the lack of enablement of the claim limitations follow.

### *Drawings*

2. New corrected drawings in compliance with 37 CFR 1.121(d) are required in this application because the hand drawn nature of the drawings make element labels and number difficult to read. Applicant is advised to employ the services of a competent patent draftsperson outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

### *Claim Rejections - 35 USC § 112*

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 8, 10 and 27 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Specifically, the specification discloses the trailing edge portion of a pulse "dispersed in to the change through evaporation of a minute fraction of the condensate" (page 33, lines 4-6),

but this does not enable the limitation "said act of receiving input comprises receiving information relating to the dispersion of light energy pulses with said system". The specification describes dispersion of the pulse, but does not describe receiving information relating to the dispersion of the pulse.

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claim 21 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 21 depends from canceled claim 19 and is not properly punctuated.

### *Claim Rejections - 35 USC § 102*

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1, 4, 5, 7, 22-25 and 27-30 are rejected under 35 U.S.C. 102(a) as being anticipated by Liu et al, "Observation of coherent optical information storage in an atomic medium using halted light pulses", Nature, (January 2001) (advanced publication), herein after referred to as "Liu".

Regarding claim 1, Liu discloses a method of controlling the propagation speed of light pulses for an optical data communications apparatus, composing: a first coherent light source adapted to produce first electromagnetic radiation (p. 490, col. 2, par. 1, lines 1-5, the 'probe' laser is the first coherent light source to produce the first electromagnetic radiation, and page 493, col. 2, last paragraph, where quantum bits, or "qubits", and quantum information processing, indicates data); and an atomic medium adapted to substantially alter the speed of propagation of the electromagnetic radiation therethrough (p. 490, col. 2, par. 1, lines 1-5); wherein the first electromagnetic radiation is used to transfer a plurality of data bits from one location to at least one second location, and wherein said atomic medium stores quantum state information that can be subsequently read out therefrom (p. 490, col. 2, par. 1, coherent information is carried by the probe pulse propagating through the atomic medium for storage or delay up to 1 ms and the stored coherence is transferred back into the radiation field).

Regarding claim 4, Liu teaches a second coherent light source adapted to produce second electromagnetic radiation (p. 490, col. 2, par. 1, lines 1-5, the 'coupling' laser is the second light source to produce the second electromagnetic radiation), and the second electromagnetic radiation cooperating with the atomic medium to provide altering of the speed of propagation (p. 490, col. 2, par. 1).

Regarding claim 5, Liu also discloses a delay device adapted to selectively delay the propagation of the first electromagnetic radiation to at least one second location (p. 490, col. 2, par. 1, the magnetically trapped, atomic cold cloud (MTACC) provides selective propagation delay for the probe laser pulse).

Regarding claims 7 and 27, Liu discloses a method of conditioning light energy in an optical data communication system, comprising: providing first electromagnetic radiation having information associated therewith (p. 490, col. 2, par. 1, lines 1-5, the 'probe' laser is the first

coherent light source to produce the first electromagnetic radiation); providing second electromagnetic radiation (p. 490, col. 2, par. 1, lines 1-5, the 'coupling' laser is the second light source to produce the second electromagnetic radiation); providing an atomic medium and irradiating said atomic medium with said first electromagnetic radiation to store as least part of said information therein and selectively and subsequently irradiating said medium with said second radiation, said second radiation at least in part controlling the readout of said stored information from said medium; wherein said act of selectively irradiating comprises controlling the application of said second radiation to said atomic medium based on receiving input from said data communication system (p. 490, col. 2, par. 1 and page 493, col. 2, last paragraph, where using the atomic medium for "quantum information processing" of quantum bits, or "qubits", inherently requires controlling the application of the second radiation to the atomic medium based on receiving input from the data communication system).

Regarding claim 22, Liu discloses the apparatus of claim 1, wherein said medium comprises a magnetically trapped medium (p. 490, col. 2, par. 1).

Regarding claim 23, Liu discloses the apparatus of claim 1, wherein said medium comprises a cooled Bose-Einstein condensate (p. 493, col. 2, last paragraph).

Regarding claim 24, Liu discloses the apparatus of claim 1, wherein said medium comprises a medium cooled by multi-dimensional Doppler cooling (p. 491, description for fig. 1).

Regarding claim 25, Liu discloses the apparatus of claim 1, wherein said alteration of the speed of propagation of said first electromagnetic radiation through said medium comprises completely stopping the propagation of said first radiation for at least a period of time (pg. 490, col. 2, par. 1).

Regarding claim 30, Liu discloses a method of storing and subsequently reading out data from an atomic medium, comprising: providing first electromagnetic radiation having

information associated therewith (p. 490, col. 2, par. 1, lines 1-5, the 'probe' laser is the first coherent light source to produce the first electromagnetic radiation); providing second electromagnetic radiation (p. 490, col. 2, par. 1, lines 1-5, the 'coupling' laser is the second light source to produce the second electromagnetic radiation); providing an atomic medium and selectively irradiating said medium with said second radiation at two or more subsequent times to said irradiation with said first radiation, said second radiation at least in part controlling the the propagation of said first radiation through said medium; wherein said act of selectively irradiating causes the same of said information to be retrieved from said medium two or more times (p. 490, col. 2, par. 1 and page 493, col. 2, last two paragraphs, where using the atomic medium for "quantum information processing" of quantum bits, or "qubits", inherently requires controlling the application of the second radiation to the atomic medium based on receiving input from the data communication system).

9. Claims 1, 4,11-14 and 26 are rejected under 35 U.S.C. 102(b) as being anticipated by Eberly et al. (US Patent 4,406,003).

Regarding claim 1 and 4; Eberly discloses an optical transmission system that functions with a method of conditioning light energy in an optical data communication system (col. 1, lines 5-17), comprising: providing first electromagnetic radiation (lambda b, fig. 6) having information associated therewith (col. 7, lines 23-30), providing second electromagnetic radiation (14, fig. 6 and col. 3, lines 52-54); providing an atomic medium (12, fig. 6 and col. 3, lines 38-44); irradiating the atomic medium with the first electromagnetic radiation to store at least part of said information therein and to transfer a plurality of data bits from one location to at least one second location (lambda b, fig. 6 and col. 3, lines 26-40), and selectively and subsequently irradiating the medium with the second radiation (14, fig. 6 and col. 3, lines 52-54), the second radiation at least in part controlling the readout of said stored information from said medium (col.

3, lines 52-54 and col. 7, lines 23-30); wherein the act of selectively irradiating comprises controlling the application of the second radiation to the atomic medium based on receiving input from the data communication system and wherein said atomic medium stores quantum state information that can be subsequently read out therefrom (14, fig. 6, col. 3, lines 52-54 and col. 7, lines 23-30, it is inherently understood that the excitation unit 14 is controlled by an input from the communication system to selectively control the propagation of the input pulses through the channel/medium).

Regarding claim 11, Eberly discloses a method of obtaining information from light energy (fig. 6 and col. 1,lines 34-45 and lines 63-65), comprising: providing first electromagnetic radiation having a plurality of information associated therewith (lambda b, fig. 6), providing second electromagnetic radiation (14, fig. 6); providing third electromagnetic radiation (lambda a, fig. 6); providing an atomic medium (12, fig. 6 and col. 3, lines 38-44); irradiating the atomic medium with the first electromagnetic radiation (lambda b, fig. 6 and col. 3, lines 26-40); and selectively irradiating the medium with the second radiation (radiation from excitation unit 14, fig. 6) so as to alter the propagation speed of the first radiation within the medium (col. 1, lines 11-17 and col. 6, lines 61-62), interrogating the medium using the third radiation (lambda a, fig. 6 and col. 3, lines 31-39); and obtaining the information from the first radiation based on the interaction of at least the third radiation with the first radiation (col. 4, lines 50-54, the step of obtaining the information is inherently understood based on the co-propagating of the first and third radiation through the channel/medium and the interaction of more than one input pulse within the medium that results in output signals obtained at the output end of the channel/medium).

Regarding claim 12, Eberly discloses the step of generating at least one light pulse based on the act of obtaining (col. 1, lines 52-58).

Regarding claim 13, Eberly discloses the step of transmitting at least one light pulse over an optical communications system (col.1, lines 18-22).

Regarding claim 14, Eberly further discloses the controlling acts of selectively irradiating and transmitting at least one light pulse over the optical communications system so as to create a desired temporal relationship between the first and at least one light pulse (col.1, lines 52-58).

Regarding claim 26, Eberly discloses the apparatus of claim 11, wherein said alteration of the speed of propagation of said first electromagnetic radiation through said medium comprises completely stopping the propagation of said first radiation for at least a period of time (col. 6, line 61 to col. 7, line 9).

***Claim Rejections - 35 USC § 103***

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liu as claimed above, and further in view of Phillips et al., "Storage of Light In Atomic Vapor", Physical Review Letters 86, 783 (January 2001), hereinafter referred to as "Phillips".

Regarding claim 3, Liu discloses all the aspects of the claimed invention as set forth in the rejection to claim 1 above, except fails to teach the medium comprises at least in part Rubidium atoms. However, Phillips teaches the medium comprises at least in part Rubidium (Rb) atoms (see abstract and p. 783, par. 1 and par. 2). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use Rubidium to modify

the atomic medium of Liu. One skilled in the art would have been motivated to use a differential material like Rubidium held at different temperatures to generate a varied type of resonance based on a Zeeman (spin) coherence of the Rb vapor so as to show a broader scope of utilizing a variety of materials for the medium for selectively controlling the propagation and parameters of light energy traveling through the medium.

12. Claims 15-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jewell et al. (US Patent 4,741,587) in view of Liu.

Regarding claim 15, Jewell discloses an optical communication system similar to an optical pulse conditioning apparatus, comprising: a medium (24, fig. 2) adapted to receive modulated light energy (23, fig. 2) from a first light source (18, fig. 2, and col. 5, lines 58-61, a transmission medium 24 is used to receive modulated light energy in the form of the pulse train 23 generated from the radiation source as shown in fig. 2); a second source of electromagnetic energy (28-1, fig. 2) adapted to irradiate at least a portion of said medium (24, fig. 2) using electromagnetic energy (col. 6, lines 13-15), said electromagnetic energy altering the propagation of said modulated light energy through said medium (col. 6, lines 13-20); and controller apparatus operatively controlling said irradiation of said medium by said electromagnetic energy so as to control at least one physical parameter of said modulated light energy (col. 6, lines 13-20, the use of the controller apparatus is inherently understood in order to control the pump radiation to the medium, i.e. pump source 28 can be controlled to increase or decrease the transfer of energy from the pump source to the waveguide 24). Jewell discloses that the transmission medium can be metal vapor (col. 3, lines 44 and 45), but does not further disclose that the medium is a trapped and cooled medium. Liu discloses a trapped and cooled metal vapor medium (p. 490, col. 2, par. 1). It would have been obvious to one of

ordinary skill in the art at the time of the invention to substitute the metal vapor medium of Liu for the transmission medium in Jewell, since Jewell teaches the metal vapor medium as an alternative medium.

Regarding claim 16, the combination of Jewell and Liu discloses at least one parameter comprises pulse width (Jewell: col. 6, lines 15-17).

Regarding claim 17, the combination of Jewell and Liu discloses at least one parameter comprises the chromatic content of the modulated light energy (Jewell: col. 5 lines 45-47).

Regarding claim 18, the combination of Jewell and Liu discloses at least one parameter comprises the amplitude of at least one constituent wavelength of energy within the modulated light energy (Jewell: col. 6, lines 15-17).

13. Claims 20 and 21 are rejected under 35 U.S.C. 103(b) as being unpatentable over the Jewell in view of Liu, as applicable to claims 15-18 above, and further in view of Suyama (US Pat. No. 5,535,050).

Regarding claim 20, the combination of Jewell and Liu discloses all the aspects of the claimed invention as set forth in the rejection to claim 15 above, except fails to teach the controller apparatus comprises an optical modulator which is adapted to modulate the electromagnetic energy. However, Suyama, in US Pat. No. 5,535,050, teaches a controller apparatus comprises a digital data processor and an optical modulator which is operatively coupled to the processor and adapted to modulate the electromagnetic energy based on signals received from the processor (44, 48, fig. 6). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate a pump source with a control circuit and a modulation circuit such as the one of Suyama for the pump source in

the optical transmission system of Jewell in order to further control the physical parameters of modulated light energy.

Regarding claim 21, the combination of Jewell, Liu and Suyama discloses a digital data processor, said processor operatively coupled to said optical modulator, said processor controlling the operation of said modulator at least in part (Suyama: 44, 48, fig.)

***Allowable Subject Matter***

14. Claim 9 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

15. Claims 28 and 29 are allowed.

***Response to Arguments***

16. Applicant's arguments filed 12 May 2005 have been fully considered but they are not persuasive.

Regarding claim 1 as anticipated by Liu, the applicant argues that Liu doesn't teach a communication apparatus, however, the quantum bits, or "qubits", and quantum information processing taught by Liu, indicates data communication.

Regarding claims 1 and 11 as anticipated by Eberly, the applicant argues that Eberly doesn't teach or suggest storing quantum state information in the medium that can be subsequently read out therefrom; however Eberly does disclose this (col. 6, line 61 to col. 7, line 9), where stopped photons are stored photons, and the stopped photons are subsequently read out (col. 7, lines 23-30). Regarding applicant's arguments against the combination of Liu and

Eberly, the arguments have been considered but are moot in view of the new grounds of rejection. Further, the heating teaching of Eberly is only one among alternative excitation methods taught, and in addition, the assertion that heating would not permit storage of quantum state information is based on counsel argument; the arguments of counsel cannot take the place of evidence in the record.

Regarding claim 15, the applicant's arguments have been considered but are moot in view of the new grounds of rejection.

***Conclusion***

17. Any inquiry concerning this communication from the examiner should be directed to N. Curs whose telephone number is (571) 272-3028. The examiner can normally be reached on M-F (from 9 AM to 5 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan, can be reached at (571) 272-3022. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (800) 786-9199.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pairdirect.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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